

NON-NATIVE INVASIVE SPECIES (NNIS)

Monitoring Question

To what extent is Superior National Forest management contributing or responding to populations of terrestrial or aquatic nonnative species that threaten native ecosystems?

Monitoring Conducted

Occurrence

Objective. O-WL-37. Reduce the spread of terrestrial or aquatic non-native invasive species that pose a risk to native ecosystems.

Approximately 2,025 acres of terrestrial Non Native Invasive Plant Species (NNIS) occur on the Superior National Forest (SNF). Highest risk species include common buckthorn, leafy spurge, purple loosestrife, spotted knapweed, Canada thistle, Tartarian honeysuckle, and goutweed (Table1). In 2006, six lakes on the SNF were known to be infested with spiny water flea including Flour, Greenwood, McFarland, Pine, Saganaga, and Crane Lakes. Spiny water flea was detected for the first time in Crane Lake in September 2006 by the SNF Fisheries and Aquatics Program (Table 1). In addition to the new infestation on the SNF, spiny water flea has also been recently documented by Voyageurs National Park in Rainy and Namakan Lakes. Rusty crayfish are now known to occur in at least twenty-five lakes on the SNF. It is likely that other lakes may be infested but have not been surveyed or monitored (Figure 1). Existing NNIS populations are of obvious concern. However the SNF is also very concerned about terrestrial and aquatic habitats at risk to future NNIS establishment and expansion. Correspondingly, the SNF has focused its detection efforts within these susceptible habitats particularly those adjacent to existing NNIS populations. See Table 1 for a more complete list of NNIS on the SNF.

Table 1. Non-native Invasive Species Known on SNF

Plants		
Goutweed (<i>Aegopodium podagraria</i>)	Canada thistle (<i>Cirsium arvense</i>)	Yellow hawkweeds (<i>Hieracium floribundum</i> and others)
Siberian Pea Bush (<i>Caragana arborescens</i>)	Bull thistle (<i>Cirsium vulgare</i>)	St. Johnswort (<i>Hypericum perforatum</i>)
Plumeless thistle (<i>Carduus acanthoides</i>)	Leafy spurge (<i>Euphorbia esula</i>)	Tatarian honeysuckle (<i>Lonicera tatarica</i>)
Spotted knapweed (<i>Centaurea biebersteinii</i>)	Cypress spurge (<i>Euphorbia cyparissias</i>)	Purple loosestrife (<i>Lythrum salicaria</i>)
Oxeye Daisy (<i>Chrysanthemum leucanthemum</i>)	Orange hawkweed (<i>Hieracium auranticum</i>)	
Common tansy (<i>Tanacetum vulgare</i>)	Common buckthorn (<i>Rhamnus cathartica</i>)	
Animals		
Rusty crayfish (<i>Orconectes rusticus</i>) Spiny Water Flea (<i>Bythotrephes cederstroemi</i>) Earthworms (Lumbricidae), Gypsy moth (<i>Lymantria dispar</i>)		

Prevention/Education Measures

- NNIS list and phenology chart developed in 2001, updated 2005.
- NNIS training for SNF employee is ongoing.
- Equipment cleaning clause – timber sale and road maintenance contracts.
- Cavity Lake Fire – gear cleaning for off-forest fire crews, spiny waterflea infested lakes (e.g. Saganaga) avoided as water source for wildfire suppression activities.
- Noxious weed poster developed and placed at BWCAW entry points in 2003.
- County Fair NNIS poster NNIS booklet developed in partnership with Friends of BWCAW and REI.
- NNIS workshops and presentations for garden clubs, Minn. Forest Resource Council, cooperator groups, public.

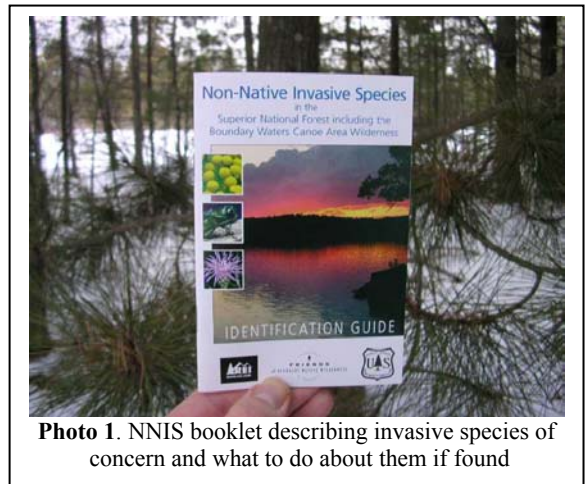


Photo 1. NNIS booklet describing invasive species of concern and what to do about them if found

Early Detection/Rapid Response

A Superior National Forest Non-Native Invasive Plant (NNIP) baseline inventory outside the Boundary Waters Canoe Area Wilderness (BWCAW) was completed in 2004. This inventory focused on roadsides, recreation sites, gravel pits, administrative sites, sampling of harvested stands.

A prioritized inventory of the BWCAW has been completed for all Districts except LaCroix, which is scheduled for 2007. The BWCAW inventory focused on campsites, portages, old cabin sites, old resort sites, and old logging camps. These inventories serve to establish a baseline which surveys in future years can be compared to.

In 2006, NNIP inventory in the Kawishiwi portion of the BWCAW resulted in NNIP being found at 159 out of the 267 (59%) sites that were checked. 6.1 acres of weed infestation were documented. The most common invasive plants were orange and yellow hawkweeds, followed by oxeye daisy and Canada thistle. Relatively little spotted knapweed or tansy was found. The majority of the weed sites were small; 94% were less than 1/10 acre. The biggest surprise was 20 new purple loosestrife sites found on Knife Lake, totaling 0.2 acre.



Photo 2. Clean boat trailers before leaving a lake



Photo 3 Plankton tow used to detect spiny waterflea in SNF lakes.

Since 2001, several species new to the SNF have been detected by SNF employees or other partners. These include: plumeless thistle (2003), Japanese knotweed (2005), meadow knapweed (2005), and wild parsnip (2006). Control actions were taken on all these species either by the SNF or Minnesota Department of Transportation (MNDOT). Early detection of these species will help prevent them from establishing across a widespread area.

Spiny water flea surveys were initiated on the SNF in 2004 to detect the presence of populations in border lakes of the BWCAW. Zooplankton tows occurred in two lakes including Sea Gull Lake and Lac La Croix. There were no spiny water flea detected in either lake. Although undocumented, it is highly probable that spiny water flea occur in Sea Gull Lake (Don Branstrator, University of Minnesota-Duluth, pers. com. 2006). In 2005, surveys occurred in 10 lakes on the SNF. Of the 10 lakes surveyed, spiny water flea was observed in 4 lakes that were

known to be infested including Greenwood, Pine, McFarland, and Saganaga. In 2006, spiny water flea surveys occurred in six lakes including Snowbank, Crane, Burntside, Echo, Vermillion, and Sea Gull Lakes. Spiny water flea was detected for the first time in Crane Lake in September 2006. Surveys in the south end of Sea Gull Lake during the 2006 Cavity Lake Fire did not detect spiny water flea.

Rusty crayfish surveys began on the SNF in 2003. Surveys occurred in 25 lakes that had recreational access to the BWCAW. Modified minnow traps were set overnight to assess relative abundance and species composition. In 2003, rusty crayfish were captured in two lakes including Hungary Jack Lake (previously known population) and Gull Lake (new detection). In 2005, rusty crayfish surveys were done on 17 lakes on the SNF. Rusty crayfish were captured in five lakes including Dumbbell, Bearskin, Hungry Jack, Saganaga, and Gull Lakes and they were observed for the first time in Bearskin and Saganaga Lakes. In 2006, rusty crayfish surveys occurred in 18

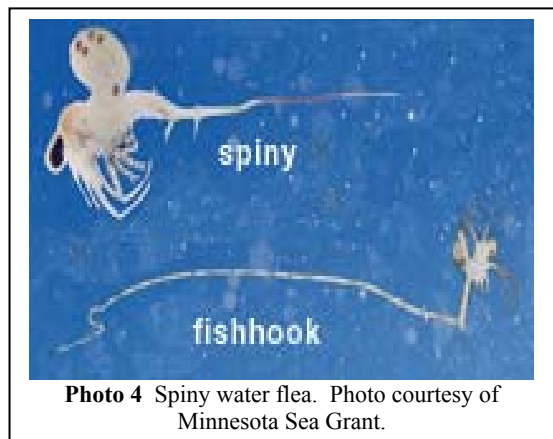


Photo 4 Spiny water flea. Photo courtesy of Minnesota Sea Grant.

water bodies including Bass, Meander, Birch, Burntside, Lake One, Pfeiffer, Echo, Crane, Cedar, Garden, Fall, Big, Tofte, Ojibway, Snowbank, Farm, South Farm Lakes, and the South Kawishiwi River. Rusty crayfish were detected for the first time in Bass, Crane, Cedar, Garden, Fall, Tofte, and Snowbank Lakes.

Control Measures

Objective. O-WL-38. Use Integrated Pest Management to: **a.** Eradicate any populations of new invaders. **b.** Contain or eradicate populations of recent invaders. **c.** Limit the spread of widespread, established invaders within the planning area.

In April 2006 the SNF Non-native Invasive Plant Management Project EA was signed, which provides for Forest-wide treatments of NNIP using an integrated pest management approach over the next 10 years. Herbicide spraying and hand pulling were used in 2006 to control NNIP. Areas targeted for treatment included the Denley Road, Tomahawk Road, Gunflint Trail, selected gravel pits, BWCAW entry points, and priority BWCAW infestations. Approximately 40 infestations within the BWCAW were hand pulled but not treated with herbicide.

Spiny water flea and rusty crayfish population monitoring will continue to occur at established locations in future years. It is anticipated that this information will be useful for providing public education/information in an effort to control future invasions on the SNF and in northeastern Minnesota.



Photo 5 Knife Lake purple loosestrife pull

Evaluation and Conclusions

Occurrence and Control Measures

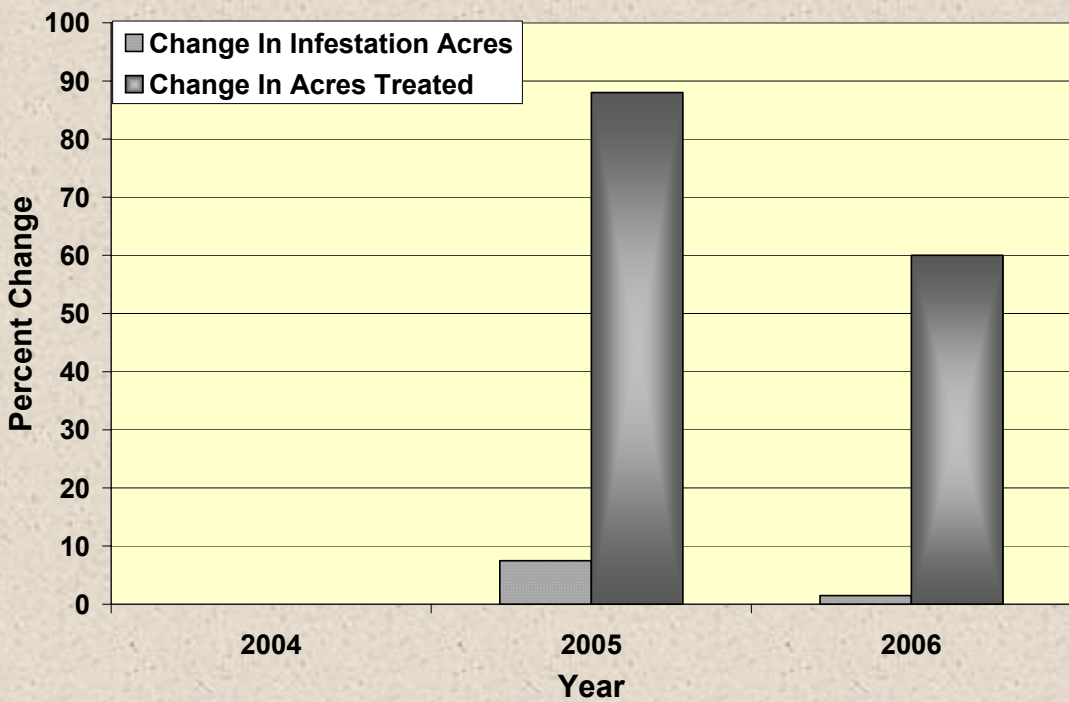
Approximately 623 new infestations comprising 25 acres of terrestrial NNIP were found during 2006. This compares to 420 infestations on 12 acres found in 2005. These discoveries combined with previously documented infestations, brings the total known NNIP acres to 2,025 acres, up from 2,000 acres reported in 2005, and 1,850 acres at the time the Revised Superior National Forest Plan was approved in 2004. This increase is primarily attributed to enhanced inventories and discoveries and not population expansion. Table 2 shows infestations found in 2006 by Project Area.

Table 2. NNIP Infestation Detected During 2006.	
(1)	Silver Island – no monitoring in 2006
(2)	Virginia EIS – no monitoring in 2006
(3)	Tomahawk – no monitoring in 2006
(4)	Dunka – no monitoring in 2006
(5)	Inga South – no monitoring in 2006
(6)	BWEIS burn units – 1 very small yellow hawkweed infestation found in BU 362
(7)	Alpine Fire burn – 15 sites totaling 0.003 ac of NNIP
(8)	Glacier Midlevel Project Area – 231 sites totaling 19 ac of NNIP
(9)	Cascade Midlevel Project Area – no new NNIP found
(10)	Kawishiwi RD portion of BWCAW - 159 sites totaling 6.1 ac of NNIP

Once high risk terrestrial species were identified, rapid treatments were implemented. In 2006 approximately 20 acres were treated, up from 8 acres treated during 2005. Weeds targeted include: spotted knapweed, Canada thistle, bull thistle, St. Johnswort, tansy, purple loosestrife, plumeless thistle, leafy spurge, oxeye daisy, and orange hawkweed. Treatments included pulling and herbicide treatments and were successful in reducing infestations by 90% or greater (See Photos 6 and 7). Despite an increase in documented infestations since 2004, the rate of treatment is greater than the rate of NNIS increase. Infestation acres grew 7.5 % between 2004 and 2005 and 1.5% between 2005 and 2006. However the amount of acres treated increased 88% between 2004 and 2005 and 60% between 2005 and 2006 (See Figure 1).



Figure 1. Change in NNIS Infestation and Treatment Acres



Recent monitoring of new and existing spiny water flea populations on the SNF suggests that this species current rate of invasion is likely increasing. In addition to the new infestation in Crane Lake, spiny water flea has also been recently reported in Rainy and Namakan Lakes. There remains a concern that lakes within the BWCAW along the US-Canadian border including, but not limited to, Knife Lake, Basswood Lake, and Lac La Croix may also become infested. Future survey efforts within the Border Lakes Area will be necessary to determine if this aquatic NNIS is spreading into these waters.

Recent monitoring of rusty crayfish populations on the SNF suggests that the SNF is not yet fully aware of all lakes currently infested by this species. Based upon recent survey efforts and detections, it is very possible that this species occurs in many lakes that have not been surveyed. In 2003-2006, rusty crayfish were known to occur or had been detected in 17, 17, 19, and 25 lakes, respectively (Figures 2). It is very likely that new infestations will be documented with increased survey and monitoring efforts in the future. There were no aquatic NNIS populations contained or eradicated in 2006.

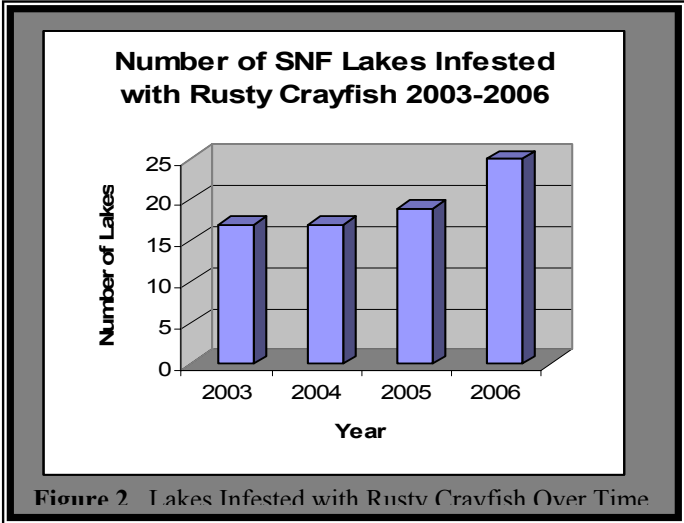


Figure 2 Lakes Infested with Rusty Crayfish Over Time



Photo 8. Rusty crayfish collected in Minnow Trap.

Standards and Guides

One applicable Standard/Guide was monitored during 2006 (G-WL-23). This guideline specified reducing the spread of NNIS during project implementation. Design criteria were created to implement this guideline for all vegetation management projects in 2006. The design criteria were implemented successfully, but no monitoring has been done on how effective the “design criteria” were in preventing weed spread.

Necessary Follow-up and Management Recommendations

After reviewing monitoring findings, there are several follow-up actions and one management recommendation to carry forward during FY 2007.

Follow-up Actions

Terrestrial NNIS

- * Continue project level monitoring of the effects of project activities on NNIP spread, and monitor the degree of NNIP spread in the Border and Clara project areas.
- * Visit NNIP sites treated in 2006 to determine the need for re-treatment in 2007.
- * Treat all known purple loosestrife sites on the SNF, and treat known Canada thistle infestations near the Turtle Lake Fire, Cavity Lake Fire, and East Zone Complex fire

Aquatic NNIS

- * Continue presence/absence surveys and monitoring efforts in lakes or other waters that have not been surveyed in the past.
- * Concentrate future survey and monitoring efforts within the US-Canadian Border Lakes Area to determine if the spiny water flea occurs in these waters. If the spiny water flea does not occur within these waters, standard index stations should be established to provide early detection information if an infestation does occur.
- * With the recent infestations of spiny water flea in Crane and Namakan Lakes work with the Minnesota Department of Natural Resources, University of Minnesota-Duluth, Minnesota Sea Grant, Voyageurs National Park, Quetico Provincial Park, The Nature Conservancy, and other partners to increase public awareness and education efforts.

Management Recommendation

Terrestrial NNIS

Visit sites treated in 2006 to determine need for re-treatment in 2007. Treat all known purple loosestrife sites on the SNF. Treat known Canada thistle infestations near Turtle Lake Fire, Cavity Lake Fire, and East Zone Complex fire.

Collaborative Opportunities To Improve Efficiency And Quality Of Program

Partnerships

In 2007 it will be important for the SNF to increase collaborative survey and monitoring efforts with other partners including the Minnesota Department of Natural Resources, Minnesota Sea Grant, University of Minnesota-Duluth, The Nature Conservancy, Voyageurs National Park, Quetico Provincial Park, and other interested partners to increase NNIS public information and education efforts. It is recommended that the Superior National Forest work closely with these partners to address the recent infestation of spiny water flea in Crane and Namakan Lakes and other waters, if they occur.

Summary Conclusions

- * Approximately 2,025 acres of terrestrial Non Native Invasive Species (NNIS) and six lakes infested with spiny water flea occur on the SNF.
- * Seven prevention/education measures were implemented.
- * Approximately 20 acres of terrestrial NNIS were treated, up from 8 acres treated during 2005.
- * Despite an increase in documented terrestrial plant infestations since 2004, the rate of treatment is greater than the rate of NNIS increase.
- * New and existing spiny water flea populations on the SNF suggests that this species current rate of invasion is likely increasing.
- * The number of lakes where rusty crayfish has been detected has increased each year since 2003 and it is likely that new infestations will be documented with increased survey and monitoring.
- * There were no aquatic NNIS populations contained or eradicated in 2006.